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# GEOPHYSICAL ABSTRACTS 115

## OCTOBER-DECEMBER 1943

COMPILED BY

W. AYVAZOGLOU AND V. SKITSKY

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# GEOPHYSICAL ABSTRACTS 115, OCTOBER - DECEMBER 1943[1]

Compiled by W. Ayvazoglou[2] and V. Skitsky[2]

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Geophysical Abstracts 1 - 86 were issued in mimeographed form by the Bureau of Mines; Abstracts 87 - 111 were published in bulletins of the Geological Survey; Abstracts 112 - 114 were issued by the Bureau of Mines Informations Circulars 7256, 7257 and 7267.

ERRATA: In Geophysical Abstracts 113, April - June 1943, p. 7, No. 6903, line 10, insert after "The case of an oscillator" the words "subjected to arbitrary ground motion is the same as that of an oscillator" ....

In Geophysical Abstracts 114, July-September 1943, p. 21, No. 7058, lines 1-2, change "... permeability of pressure" to "... permeability or pressure."

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7273."

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## 1. GRAVITATIONAL METHODS

7133. Clewell, D. H. The Gravimeter. Proc. and Trans. Texas Acad. Science 1941, Austin, Tex., vol. 25, 1942, pp. 86-88.

Static gravimeters, unastatized and astatized, are considered to be the most practical for oil exploration. One gravimeter is described using a beam whose moment about a pivotal axis is elastically balanced. Magnetic or electric fields are deemed unsatisfactory for balancing gravitational force because they cannot easily be kept constant. The gravimeter described is capable of detecting a change in altitude of 3 inches and a change in latitude of about 150 feet. - V. S.

7134. Gunn, Ross. A Quantitative Evaluation of the Influence of the Lithosphere on the Anomalies of Gravity. Jour. Franklin Inst., Lancaster, Pa., vol. 236, No. 1, 1943, pp. 47-65.

A quantitative investigation is made of the influence of a strong elastic lithosphere on departures from isostasy. Isostasy is shown to be a special case of a more general principle that may be called the principle of isobaric equilibrium. This principle, which expresses the condition for vertical equilibrium, is formulated quantitatively both in terms of the resultant vertical stresses in the lithosphere and in terms of measurable gravity anomalies. Employing the principle, a stress function may be determined that permits an estimate of the fraction of the uniform superposed load carried by the lithosphere. By applying this method, it is found that for the central region of a block to be in substantial isostatic adjustment (96 per cent), the linear dimension of the load must approximate 330 km., a value more than six times that often assumed. The basic constant characterizing the elastic deformations of the lithosphere is determined by appeal to geological data from deltas and regions near a thrust fault. The values so obtained suggest a value of 50 ± 15 km. for the effective thickness of the lithosphere. The deformed figure of the lithosphere for certain special types of load have been worked out, together with the stress function that measures both the gravity anomaly and the resultant vertical stress. - Author's abs.

7135. Gunn, Ross. A Quantitative Study of Isobaric Equilibrium and Gravity Anomalies in the Hawaiian Islands. Jour. Franklin Inst., Lancaster, Pa., vol. 236, No. 4, 1943, pp. 373-390



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The deformation of a strong elastic lithosphere supported by an underlying weak magma is calculated for a long, mountainous load. The deformations produce vertical superposed stresses in the lithosphere that contribute to the support of the mountain and distribute its weight over a large area. Employing the principle of isobaric equilibrium, the distribution of the vertical supporting stress and the associated gravity anomalies may be determined by analysis. The results of the analysis are applied to the Hawaiian chain, and it is shown that the calculated physical properties and gravity anomalies are remarkably like those observed. It is inferred from the study that: (a) A strong lithosphere underlies the Hawaiians, and this section is practically identical with those underlying other regions; (b) the lithosphere will support one-sided stresses approximating $10^9$ dynes/cm.$^2$ for long periods of time; (c) the distribution of gravity anomaly may be described quantitatively in terms of the calculated deformations; (d) the principle of isobaric equilibrium is obeyed throughout the region whereas the isostatic principle is generally violated; and (e) the distribution of compensating masses is not at all like that demanded by the principle of isostasy. It is concluded that isostasy leads to results that are clearly wrong when applied to mountains or other deformed regions. The principle of isobaric equilibrium appears, however, to be well-established by the investigation. - Author's abs.

7136. Martin, Luis. Estudios gravimetricos realizados en la Provincia de Mendoza. (Gravimetric Studies Made in the Province of Mendoza.) Bol. Info. Petrol., Buenos Aires, vol. 19, No. 215, 1942, pp. 76-77.

In 1940-41 a gravimetric survey was made in the northern part of Mendoza, Argentina, over 30,000 sq. km. of Quaternary deposits. A sketch map is given of the area explored. The gravimetric values were found to depend on general regional features, such as the depth of the basement and large intrusive developments. Fifteen positive anomalies were traced in well-defined lines. These anomalies are described. Their distribution forms several groups. The results indicate that further research would be profitable. - V. S.

7137. Romberg, Frederick, and Barnes, V. E. The Gravitational Anomaly of the Smoothingiron Granite Mass (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 325.

Observations of the force of gravity are made in the neighborhood of the Smoothingiron granite mass in Llano County, Tex. A clearly defined gravitational anomaly is noticed. The gravity data, when considered in the light of the available geological information, permit conclusions to be drawn concerning the shape of the granite mass.

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7138. Woollard, G. P. A Transcontinental Gravitational Traverse and Its Relation to Regional Geology (abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 349.

The writer established a transcontinental traverse from Morro Bay Calif., to Sea Bright, N. J., using a Humble type X gravimeter. The results indicate that the country can be broadly divided into two parts, with the dividing line near the Kansas-Missouri border. In the eastern half no definite correlation is observed between structural geologic features except that the structural "highs" and "lows" appear to have an inverse relation to the gravity profile. An exception is the Appalachian Basin, which has a gravitational trough. In the western half of the country, from the basin and range region to the Pacific area, the gravity values tend to conform with the geologic structure. There are, however, certain anomalous areas, such as the San Joaquin Valley, where a gravitational "high" occurs in a structurally low region. The isostatic effects are for the most part small in the eastern part of the continent but extremely large in the western part. - V. S.

7139. Woollard, G. P. Transcontinental Gravitational and Magnetic Profile of North America and Its Relation to Geologic Structure. Bull. Geol. Soc. America, Washington, D. C. vol. 54, No. 6, 1943, pp. 747-790.

A series of magnetic and gravitational measurements at 7-mile intervals was made across the continent from Sea Bright, N. J., to Morro Bay Calif. For the most part the data were complementary, indicating a common control, although this varied with the regions crossed. In the eastern half of the country lithologic variations in the basement apparently controlled; in the western part of the country, structure was reflected in the gravity values due to the large density contrast between the sediments and the crystalline and consolidated formations. The magnetic variation for the most part reflected lithology.

Large anomalies in both sets of data must originate from deep-seated sources. The marked regional effect upon which the above variations were superimposed apparently reflects in the gravity value the elevation of the stations, and the amount of the anomaly is approximately that of the isostatic correction. For the magnetic values the regional effect is believed to be primarily related to inadequate longitude correct In general no correlation could be made between the reduced data and the large regional geologic structures. - Author's abs.



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7140. Wright, F.E. Gravity-Measurements in Guatemala. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 512-515.

A network of gravity stations about a volcano is desirable with a view to determining the movement of molten rock from under the volcano toward the surface. Since the density of the molten magma is likely to differ from that of the surrounding rock, the approach of the magma to the surface should affect gravity values. Preliminary to establishing a network of stations about the volcano, a base station should be occupied with a gravity pendulum apparatus to serve as reference point for measurements with a gravity meter. The author made such base-station measurements with the Brown pendulum apparatus at Guatemala City and Quezaltenango for observation of the Santa Maria Volcano; the gravity values are given. - V. S.

## 2. MAGNETIC METHODS

7141. Fleming, J. A., and Scott, W. E. List of Geomagnetic Observatories and Thesaurus of Values, II. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 3, 1943, pp. 171-182.

Table 1, Annual Values of Geomagnetic Elements at Observatories, is continued in this issue (for the first part of this table see Geophys. Abs. 114, No. 7015). - V. S.

7142. Geyer, R. A. Geomagnetic Survey of a Portion of Southeastern New York (abs.). Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 289-290.

The area covered by this survey comprises portions of northern Westchester, Putnam, and southern Dutchess Counties. Four hundred and eighty-six stations were occupied, at which the vertical component of the earth's magnetic field was measured with an Askania magnetometer. These data were plotted on a map on a scale of 1 : 30,000. The resulting isogram chart was superimposed upon a geologic map of the area to correlate changes in the magnetic field with changes in the geologic characteristics. A rather close correlation was shown to prevail in most instances. The area surveyed included formations ranging in character from only slightly metamorphosed sedimentary to highly metamorphosed igneous and sedimentary rocks. The total variation in the earth's field in this area was approximately 4,000 gammas. - V. S.



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7143. Johnston, H. F. American Magnetic Character-Figure, $C_A$, Three-Hour-Range Indices, K, and Mean K-Indices, $K_A$, for April to June, 1943. Terrestrial Magnetism and Atmospheric Electricity, Baltimo Md., vol, 43, No. 3, 1943, pp. 163-166.

Tables of indices are given. The American magnetic character-figure $C_A$ is based upon the reports of the seven American-operated observatories. The 3 hour-range indices K are compiled separately for each of these observatories; the indices range from "zero" (very quiet) to "9" (extremely disturbed). - V. S.

7144. Knapp, D. G., and Howe, H. H. Magnetic Observatory Results at Tucson, Ariz. for 1931-32. U. S. Coast and Geodetic Survey, Washington, D. C., MC-12, 1942, 118 pp.

This publication contains 108 tables of observatory results and an explanatory text. The tables give extreme and mean temperatures, obser and adopted values H, Z, D, abrupt changes, noncyclic changes, summari of monthly and annual means, principal magnetic disturbances, etc. The text covers the work in several allied fields (seismology, atmospheric electricity, earth currents), description of instruments, constants of the magnetograph, absolute observations and base-line values, explanations of tables, etc. - V. S.

7145. Lasareff, P. P. Études des variations séculaires du magnétisme terrestre. II. Les Variations séculaires et les anomalies magnétiq locales. (Studies of Secular Variations of Terrestrial Magnetism. Secular Variations and Local Magnetic Anomalies.) Compt. rend. (Doklady) Acad. Sciences U. R. S. S., Moscow, new ser., vol. 27, N 1940, pp. 937-939.

Direct observations of secular geomagnetic variations and previou results of mathematical formulas deduced for them are compared (see A 114, No. 7022). For Paris, where magnetic declinations have been mea since about 1540, the agreement between observed and computed secular amplitudes is very satisfactory. Certain discrepancies are found, thoug which will be discussed in forthcoming papers. Equations are further evolved for isolines and isopores. The isopore equations furnish a basis for conclusions. If the field of terrestrial magnetism is differentiated in a variable field of the earth's interior, producing secular variations, and an invariable field of the earth's crust, then the mathematical deductions agree with empirical observations only for a given moment. Any change of the field with time, characterized by isopores, brings about deviations



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from observation. Therefore, it must be concluded that the magnetization of the earth's crust producing the abnormal field is in part dependent on time. - V. S.

1942. McNish, A. G. Geomagnetic Survey of the Volcanic Areas of Guatemala. Nat. Research Council, Am. Geophys. Union, Trans. 1941, part II, Washington, D. C. 1941, pp. 508-512.

The vertical component of the earth's magnetism was surveyed in the vicinity of the Santa Maria Volcano, Guatemala. It revealed low values in localities where volcanic activity is evident. The hypothesis was thereby confirmed that the volcanic rift is underlain by vast bodies of hot rock. The evidence also indicated an extension of the effect of the volcanic region far beyond the rift. Additional work showed that, as the rift is approached from the high inland plateau, vertical intensity decreases at a greater rate than would be due to change in latitude. After dipping sharply to the low values of the rift, vertical intensity rises to a maximum as the coastal plain is approached. The subsequent drop over the coastal plain is greater than would be produced by the latitude effect. The average vertical intensity on the coastal plain is nearly 2,000 gammas higher than on the inland plateau, although it should be several hundred gammas lower because of the difference in latitude. The writer concludes that, on a world scale, a considerable difference in magnetic values assigned to Guatemala would arise according to whether observations were made inland or on the coast, though either region would appear undisturbed. - V. S.

1947. Nettleton, L. L., and Elkins, T. A. Association of Magnetic and Density Contrasts with Igneous Rock Classifications (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 328.

The frequent coexistence of strong magnetic and gravity anomalies directs attention to the properties of igneous rocks which may account for them. Density data are direct and unambiguous, but magnetic data are much less certain. On the assumption that it is determined by disseminated magnetite, the susceptibility can be estimated from the proportion of magnetite in the rock. The possibility of estimating magnetite content from chemical analyses is examined, and while not very satisfactory it probably gives relative values of some merit. From published chemical analyses the magnetite content and probable intensity of magnetization are calculated for some 1,450 samples of igneous rocks, for which density values are also given. The values and resulting contrasts are analyzed statistically and tabulated for the C.I.P.W. and the Iddings method of classification.

1943



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The contrasts, thus determined, are in reasonable agreement with expecta tions from the analysis of magnetometer and gravimeter surveys.

7148. Stephenson, E. L. Geophysical Surveys in the Ochoco Quicksilver District, Oregon; a Preliminary Report. Geol. Survey, Washington D. C., Bull. 940-C, 1943, 98 pp.

Three geophysical surveys were made in 1941 in the Ochoco quicksilver district, Oregon, by the Section of Geophysics, Federal Geological Survey, in cooperation with the Oregon Deaprtment of Geology and Minera Industries. The primary purpose was to determine the value of magnetic and electrical measurements for assisting mine development. Becuase of the physical nature of cinnabar and the small size of the ore bodies, findir deposits required delineation of geological structures associated with the Many of the rocks in the Ochoco district are paramagnetic. Accordingly, the mapping of the ore-bearing fault systems was based upon detailed magnetometric surveys, supplemented by resistivity measurements. It was found that the surveyed areas are magnetically variable and possess many anomalies. Some anomalies appear to depend on differences in type of rock; but other magnetic patterns are determined by the fault systems. The geophysical surveys resulted in concrete suggestions for further prospecting. The report is illustrated by magnetic and topographic maps and resistivity profiles. - V. S.

7149. Sucksdorff, E. Die erdmagnetische Aktivität in Sodankylä in den Jahren 1914-34 (Terrestrial Mangetic Activity at Sodankylä in the Years 1914-34). Veröffentlichungen des geophysikalischen Observatoriums der finnischen Akademie der Wissenschaften, Kuopio, No. 25, 1942, 68 pp.

The Sodankylä Observatory made observations during 1914-34 in the vicinity of the auroral zone. The hourly variation of the vertical component of the earth's field, minus the amount attributable to its regular diurnal variation, was taken as the measure AZ of magnetic activity. The mean activity observed in the period under consideration was: AZ = 131. The most active year was 1930: AZ = 244; the least active years were 1914 and 1924: AZ = 64 and AZ = 62. The yearly curve of geomagn activity consisted of two 6-month waves; the maxima fell on March and October, the minima on July and near December. The daily curve of activity was represented by a single regular wave, with the maximum shortly before local midnight and the minimum a little before noon. The Sodankylä results likewise cover other aspects of geomagnetic activity. - H. D. Harradon, Terrestrial Magnetism and Atmospheric Electricity, vol 48, No. 2, 1943, pp. 113-114; condensed by V. S.



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7150. Vestine, E. H. The Reduction of Magnetic Observations to Mean of Year (abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 441.

Measurements of the earth's main field are affected by continuously varying electric currents flowing above and below the earth's surface. The nature of the monthly and daily variations in these measurements has been studied for the Polar Year 1932-33. The monthly mean departures from annual mean values at magnetic observatories vary in a systematic way with the position on the earth. Changes with position depend in a marked way upon geomagnetic latitude. The departures show a field symmetrical about the geomagnetic axis and equator, upon which is superposed a similar field depending locally in intensity on the season of the year. The daily mean departures from monthly mean values give rise to a world field of a general type similar to that of the monthly departures from the annual mean. - V. S.

7151. Wasserfall, K. F. Periodic Changes in $\Delta$ D at Oslo, 1843 - 1930. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 3, 1943, pp. 145-150.

The observations of the magnetic horizontal intensity (H) at the Oslo Observatory have been published previously (see Geophys. Abs. 106, No. 2152). The present paper gives the mean values $\Delta D = (H_{14} - H_9)$, 1843-1930, grouped according to seasons, with a discussion of possible periodic phenomena. The periods of 11 years, 8 months, and 8 years in $\Delta$ D variation are examined, in connection with corresponding variations of sunspots. Attention is also given to the secular variation in $\Delta$D, and in D at $09^h$. - V.S.

7152. Wasserfall, K. F. Three-Hour-Range Index, K, at Dombås Observatory During 1939 to 1942. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 3, 1943, pp. 151-160.

The International Association of Terrestrial Magnetism and Electricity established in September 1939 a 3-hour-range index K characterizing the variation in degree of irregular magnetic activity (storminess) throughout each day. The author presents the data for index K at Dombås Observatory, Bergen, Norway, 1939-42, giving annual mean values, frequency distributions, diurnal variation, relation to sunspot numbers R, recurrence of magnetic activity for each solar rotation period, etc. Domås data confirm the recurrence of geophysical elements of high and low values over a solar rotation period of 27 days. - V. S.

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7153. Woollard, G. P. A Comparison of Two Sets of Transcontinental Magnetic Data (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 451.

In the summer of 1940 a traverse was run by the author from Sea Bright, N. J., to Morro Bay, Calif., with the Askania Schmidt vertical-component magnetometer. For control, a line of base stations about 35 miles apart was first established across the country. Then, in making the final traverse, these bases were reoccupied with a spacing of about 5 miles between stations. A comparison of the magnetic intervals betwee bases on the two traverses showed throughout the same magnetic picture Most changes were about 300 to 400 gammas in relatively undisturbed portions of the country and about 1,000 gammas in areas where igneous rocks are close the surface. The average check over the entire traverse for the base-station intervals was about 50 gammas. - V. S.

Woollard, G. P. Transcontinental Gravitational and Magnetic Prof of North America and Its Relation to Geologic Structure. See No. 7139.

## 3. SEISMIC METHODS

7154. Agocs, W. B. A Method of Determining the Time Break on Deep-S Records from the Water Sound Arrivals (abs.). Geophysics, Menas Wis., vol. 8, No. 3, 1943, p. 330.

A method is presented whereby through the use of the direct water wave first arrival, and the first and second reflections of sound from the surface of the sea, the following data may be obtained: (1) The ratio of the depth of the shot below the surface of the sea to the lateral distance between the shot and detector; (2) the lateral distance between the shot and the detector at the bottom of the sea; and finally (3) the time of deto nation or the time break. Calculation of the velocity of sound in sea wat shows a linear variation of the velocity in definite zones with a rather abrupt change in velocity from zone to zone, as the depth is varied. Cur ture due to refraction is found to be negligible. Sample computations ar given.

7155. Alcock, E. D. Selection of Computational Methods for Seismic Pa Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 297-307.

Due to the decrease in magnitude of structures being sought in seismic exploration, the selection of the most accurate method of compu



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assumes increasing significance. The underlying assumptions and characteristics of several common computational methods are discussed, and an analysis is made for a specific case. - Author's abs.

7153. Birch, Francis. The Problem of Identifying the Crustal Layers. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 552-556.

Seismic records can be used for determining the constitution of the earth's crust down to 40 km. The method is based on the velocity of wave propagation in different materials as affected by elasticity at high pressures and temperatures. The existing measurements have shown that igneous rocks at high pressure are very nearly isotropic elastically; accordingly, it is possible to calculate the velocity of the compressional wave and Poisson's ratio. The author has also determined the influence of temperature on the velocity of the shear wave. These data point to small temperature effects on velocities and lead to the conclusion that velocities in any rock similar to granite must be about 5.9 to 3.4 km./ sec. in the layers extending to 15 km. or more, except within a few kilometers from the surface. It may thus be surmised that the top layer in New England and the second layer in southern California probably are not far from granite in composition. The basement complex, predominantly granitic, comes very close to the surface in New England; the bottom layer is probably olivine or dunite. - V. S.

7157. Blake, Archie. The Possibility of Seismic Measurement of the Rotation of the Earth's Core. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 387-392.

In the motion of the earth the axis of rotation of the liquid core may lag behind the axis of the rock mantle, due to the slow transfer of angular momentum to the core. Inglis has estimated the angle of lag at 2°. Seismology should assist in the determination of this angle. The bending of the seismic rays on entering and leaving the core would be altered by the rotation; moreover, the waves after penetrating the core would be carried along with it. Both these effects should change the travel time. The author presents his calculations of the magnitude of this change. The bending of the ray on entering and leaving the core is obtained by Huygens' construction. A seismic wave traveling through the bottom of the mantle and the top of the core will be refracted according to Snell's law. - V. S.



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7158. Dix, C. H., and Lawlor, R. C. Computation of Seismic Dips Below Unconformity. Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 105-118

Formulas giving the strike and dip of a plane reflector beneath a series of layers separated by interfaces of known strike and dip are developed in terms of seismic data obtained at the surface. The formulas for the position of a plane reflector beneath a single unconformity are also developed. Examples show the extent of the influence of the strike and dip of a single unconformity on the computation of the strike, dip, and position of the reflector yielding a given set of surface data. - Author's abs.

7159. Gould, M. J. Analysis of Various Proposed Explanations of the Ground Roll (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 329.

The quest for deeper seismic reflections has led to instrumental perfection of such a degree that future progress will depend upon an increased knowledge of the ground motion. As a step in this direction, the author analyzes various proposed explanations of the ground roll. Consideration of gravitational waves in a viscous medium of finite depth leads to velocities too small for ground-roll wave lengths. The theory of Love waves on a visco-elastic layer overlying a visco-elastic substratum offers a possible explanation of the observed predominant ground-roll frequencies and a reduction of Love wave velocity because of the viscosity. The importance of Bateman's "secondary Rayleigh wave" cannot be known without the solution of the complex problem of the partition of energy at the source of the Rayleigh waves. An examination of seismic data on the velocity of the ground roll indicates that the observations are not necessarily inconsistent with the theory of dispersion of Rayleigh waves on a layered elastic medium, but that there may be other causes of the observed dispersion. In explaining certain unusual ground-roll velocity variations near Fresno, Calif., the theory applies rather well, although the data are not very extensive. Analysis of three-component ground-roll data leads to the required theoretical value of the ratio of major to minor axis of the retrograde particle-motion ellipse, although there also exists an anomalous initial forward cycle of particle motion.

7160. Horton, C. W. Secondary Arrivals in a Well Velocity Survey. Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 290-296

Seismograms obtained in a well survey of the Shell-Longleaf Lumber Co. #1, Vernon Parish, La., showed well-developed secondary arrivals



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which satisfied a velocity formula V = (2000 + 0.27 Z) feet per second. If these arrivals are assumed to be transverse waves, a value of 0.43 for Poisson's ratio is obtained. On this same assumption, values of the modulus of regidity and bulk modulus are computed for various depths. It is shown that the velocity of the secondary wave does not satisfy the equation developed by Lamb for thick-walled Tuve waves, - Author's abs.

[illegible]. Lynch, W. A. Trials of Galvanometers of Various Periods with Electromagnetic Seismometers (abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 407.

Galvanometers with a variety of periods have been tried with electromagnetic seismometers to extend the usefulness of the latter. A filtering effect is obtained by means of such a combination, so that certain earth vibrations are suppressed and others are magnified. As a result of this research, the usual Benioff seismometer has been equipped with a short-period galvanometer having a period of about a fifth of a second and with a long-period galvanometer having a period of about a minute. Recording is improved greatly by the use of three galvanometers: (a) The original short-period; (b) Leeds & Northrup Type-R, with a period of 4.5 seconds; and (c) Leeds & Northrup Type-P ballistic, with a period of 25 seconds. It has also been possible to increase the effectiveness of the Galitzin-Wilip instruments in the same way. The microseismic disturbances on the 4.5- and 6.5-second galvanometers have been much less than anticipated. Experiments are continuing. - V. S.

[illegible]. Neumann, Frank. The Analysis of the El Centro Record of the Imperial Valley Earthquake of May 18, 1940. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C. 1941, p. 400.

The author has analyzed the El Centro Earthquake records of May 18, 1940, by converting the active portion of the three acceleration curves to velocity and displacement and constructing resultant-motion graphs for limited periods of time. From this study he draws the following conclusions: (1) In the epicentral area the same laws of seismic wave propagation are found as in the case of distant earthquakes, that is, the resultant ground motion is apparently a combination of longitudinal and transverse waves which is not seriously disturbed by the slipping motion along a nearby fault; (2) dominant periods, for the shorter period waves, are clearly in evidence only in directions which are longitudinal and transverse with respect to the direction to the epicenter; (3) along oblique coordinates, not "square" with



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the epicentral direction, the longitudinal and transverse waves in the shorter-period range combine in such a complex pattern that dominant periods are practically nonexistent and the period-amplitude graphs are merely smooth curves or envelopes which embrace wide ranges of period (4) fairly reliable curves are now available to show, for the more comple type of record, the variations of acceleration, velocity, and displacement with period; (5) from a study of rotational characteristics of the resulta motion graphs, it is found that rotational motions are of definite periodic (reversing) character." - V. S.

7163. Perry, E. L. The Moodus Earthquake and the Cause of Earthquake in New England. Nat. Research Council, Am. Geophys. Union, Tran of 1941, part II, Washington, D. C., 1941, pp. 401-404.

Two earthquakes occurred at Moodus, Conn., on March 2 and 13, 19 The instrumental data gathered by the Benioff stations at Fordham, Harv Weston, and Williamstown indicate that the epicenter in both cases is located at longitude 72°25.7' west and latitude 41°28.2'north. The focus must be placed in the deep crustal or subcrustal layers, possibly at a dep of about 10 miles. Records show a strong "false S" phase preceeding th probable S phase. The two shocks are typical of Moodus earthquakes in general. In regard to causes the evidence is conflicting. While the glaci isostatic theory must be considered possible for earthquakes in the Nort eastern States, the bulk of the evidence seems to point to other causes of isostatic adjustment, such as uplifted areas in the Appalachians. The on possible conclusion at present is that the region of Moodus and other Connecticut localities still plays an active role in Appalachian geology. -

7164. Randall, L. E. Geophysics in the Appalachian Area (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 325.

The problems encountered in seismic surveying in the Appalachian area are largely the result of surface or near-surface phenomena. Ther is, apparently, in the local highly dissected erosional pattern a sporadic decay or loss of velocity in the rock masses situated above the lowest co tact between country rock and erosional fill. For one such area the auth presents maps of average-velocity isohorizon contact. He also gives a of one area before and after the velocity correction. Attention is furthe called to an apparent relation between isovelocity discontinuities and faulting. - V. S.



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7165. Rosaire, E. E. An Analysis of the Refraction Collapse of 1930. Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 9, 1940-41, pp. 58-59.

The author analyzes the causes of the decline of the seismic refraction method since 1930. In the period 1924-30 this method helped in discovering nearly 50 salt domes, more than had been discovered in the same area during the previous 20 years. But in 1930 the 22 wildcat tests drilled on refraction anomalies gave 17 failures. Such a low efficiency led to abandoning refraction prospecting. However, the author recently observed a significant fact. Nearly 30 dry holes drilled on refraction anomalies were located on the fringes of subsequently discovered productive fields. This proximity points to misunderstanding of the initial refraction data. Petroleum accumulations usually are flanked by zones of sediments characterized by seismic travel speeds higher than normal. These local travel-speed "highs" had been misinterpreted as indications of structure. The error occurred because the actual structure, forming here the fringe of a dome expanding elsewhere in the vicinity, was deeper-seated and lower in relief than established theory would lead prospectors to suppose. - V. S.

7166. Sawdon, W. A. Geophysical Activities in California. Petrol. Eng., Dallas, Tex., vol. 14, No. 6, 1943, p. 66.

At present most Californian geophysical work is in and around the Sacramento Valley, where there have been gas discoveries but no oil finds. The reflection seismograph is most commonly used although there are five gravimeter parties in the field. Geophysical exploration has also progressed in the Los Angeles Basin and the Santa Maria, Ventura, and San Joaquin Valleys. The greatest amount of seismic reflection work was done in the San Joaquin Valley. At first large features were sought; then smaller features down to depths of 7000-8000 feet; and later features down to 10,000 - 11,000 feet. Very careful interpretation is needed at these great depths. - G. D. H., Jour. Inst. Petrol., vol. 29, No. 235, 1943, p. 254A; condensed by V. S.

7167. Science. A New Seismograph in Mexico. Lancaster, Pa., vol. 97, No. 2518, 1943, p. 303.

The State government of Puebla, Mexico, has acquired a Benioff vertical-component seismograph, to be installed at the National Astrophysical Observatory at Tonantsintla. - V. S.



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7168. Shugart, T. R. Frequency Discrimination in the Weathering (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 327.

The various factors controlling the "character" of reflection seismograph records are so numerous and so complex that it is very difficult to isolate and investigate each of them experimentally. One of these facto is the frequency discrimination due to multiple reflections in the weather layer. With a few simplifying assumptions this problem reduces to one already treated in the classical theory of accustics. It is shown that for a given weathering depth the transmission is a periodic function of frequency. The ratio of the maximum to the minimum transmission is near equal to the square of the ratio of the specific acoustic impedance of the unweathered to that of the weathered layer. Graphs of transmission as a function of frequency are shown for various weathering thicknesses.

7169. Stechschulte, V. C. The North Carolina Earthquake of December 1940 (abs.). Nat. Research Council, Am. Geophys. Union, Trans. o 1941, part II, Washington, D. C., 1941, p. 406.

A small earthquake occurred in northwestern North Carolina about 1:47 a.m., eastern standard time, December 25, 1940. Shocks were reco at approximately this time at Cincinnati, St. Louis, Pittsburgh, Williams Weston, and Fordham, but attempts to correlate the readings suggest tha the New England stations recorded a different shock occurring at nearly the same time. A number of small shocks occurred in this general regi of the Appalachians in recent years.

7170. Wolf, Alfred. The Motion of a Weight on the Surface of an Elastic Earth (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 3

The motion of a geophone case placed on the surface of an elastic solid does not follow faithfully the motion of the solid at high frequencie This subject was discussed experimentally and theoretically. In effect, weight placed on the surface of an elastic solid constitutes a damped oscillating system. The elastic restoring forces are determined by the area of contact between the weight and the surface of the solid and by th elastic moduli of the solid. The mass of the solid also contributes to th inertia of the system. Equations are developed for these forces on the assumption that the wave length is long compared with the linear dimens of the area of contact between the weight and the elastic solid. This lea to a determination of the natural frequency of osscillation and of the decrement of such a system.



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7171. Young, W. H., Jr. Results of a Detailed Reflection Profile in New York (abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 330-331.

Of the many prospecting methods used in the New York-Pennsylvania region the reflection seismograph has proved most successful. Still, the abundance of surface and shallow-well data in this area leads the skeptics to ask: "Where has seismograph work found structure that could not have been found by other means?" The author offers examples in support of seismic surveying. Maps, cross sections, and methods of profiling are presented for an offset location in Independence Township, N. Y., with instances of structure determination proved by subsequent drilling. It is pointed out further that reconnaissance work must be supplemented with detailed profiling; a close spacing of depth points is necessary in fault profiling. - V. S.

## 4. ELECTRICAL METHODS

7172. Bates, F. W., and Wharton, J. B., Jr. Anse La Butte Dome, St. Martin Parish, La. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 27, No. 8, 1943, pp. 1123-1156.

Anse la Butte is located on the Louisiana Gulf Coast. The dome is of piercement type, with salt at a depth of 160 feet. Geophysical exploration contributed to its deeper flank production in 1940. The present paper reinterprets subsurface conditions in the light of recent data. These data include electrical logs of wells in different structural positions. On the basis of these logs the oil-bearing zones have been identified at their producing depth in regard to characteristic thickness and sand development. Illustrations of type logs are presented, with generalized columnar sections of formations and producing sands encountered above 5,000 feet, and with diagnostic faunal zones. - V. S.

7173. Doll, H. G. A Method for Determining Formation Dip and Strike in the Drill Hole (abs.). Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 11, 1942-43, p. 43.

The paper discusses a method and apparatus to determine the dip of formations traversed by a drill hole by means of electrical measurements in the hole. The process consists in recording the spontaneous potentials present along three oriented generatrices in the hole. By comparing the three curves thus obtained, and applying a correction factor to compensate



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for any deviations of the hole, the dip angle and the dip direction are determined. Excellent accuracy is obtained for dip angles over 10°. Because the method is simple and the apparatus rugged, the measurement are rapid and reliable; consequently they can be made at all the levels which are of interest at any time after the well has been drilled. Mechani cal cores are not needed to evaluate the dips. A convenient, time-saving precedure is to perform the dipmeter survey at the time the electrical log is taken, using for both operations the same cable and truck. Actual examples of results obtained in wells of the Gulf area are given.

7174. Evjen, H. M. Utility of the Electric Methods in Geophysical Explo- ration. Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 146-15

The theoretical possibilities and the physical background of electri methods are considered in a qualitave manner. A rigorous mathematical treatment of the problem is at present a practical impossibility because the electric properties of the ground are not sufficiently well known. By analogy with the seismic method of exploration, however, where the rigorous physical optics governing the transient generated by exploding dynamite, and the propagation of said transient in general, have been sad neglected, this lack of mathematical rigor should not be a serious stumbl block. It is concluded that the possible utility of electric methods can be best-appraised in terms of the known utility of electric well logging. Thi possibility, according to the author's experience, can be attained only by a departure from the traditional electric methods. One such departure is described in general terms. - Author's abs.

7175. Kornfeld, J. A. Electrical Logging Through Thick Salt Zone. Petr Eng., Dallas, Tex., vol. 14, No. 12, 1943, pp. 90-94.

In the shallow drilling of thick salt deposits the continuous circula- tion of rotary drilling mud through the saline beds has a detrimental effe on electrical logging. It minimizes the spontaneous electrical potential recorded by the log and complicates interpretation. This effect has been overcome in central Kansas by replacing the lower part of the column of salt-laden drilling fluid with fresh-water mud. The mud is pumped throu the drill stem from the bottom of the hole. At the same time the recordi graph should be given a wider range. The spontaneous-potential electric curve then shows in sharper relief the porous zones and the relative values of porosity breaks. The paper gives a brief review of the theorie dealing with electro-chemical properties of drilling fluids, of experimen work in the Coralena pool, Kansas, and of the field practices. - V. S.



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7176. Rose, N. A. Ground Water and Relation of Geology to Its Occurrence in Houston District, Texas. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 27, No. 8, 1943, pp. 1081-1101.

The Federal Geological Survey, the Texas State Board of Water Engineers, and the City of Houston began in 1930 a joint survey of the ground-water supply in the Houston district. The present study of this investigation uses the electrical logs of oil tests and water wells as a basis for subdividing into seven zones the geological formations providing the water. The formations are upper Miocene, Pliocene, and Pleistocene. The zones have been correlated along two lines. Examples of cross sections are presented, and the zones are described in the course of the study. - V. S.

7177. Sawdon, W. A. Electrical Logging in Oil-Base Drilling Fluid. Petrol. Eng., Dallas, Tex., vol. 14, No. 9, 1943, pp. 124-126.

Oil does not conduct electric current. Therefore, oil-base drilling fluids interfere with electrical logging. Yet, these fluids must be used in drilling through low-pressure sands where loss of water into the formation is detrimental. Accordingly, special instruments have been developed to procure electric logs in holes containing oil-based fluids. One such instrument is described. It has a contact-electrode sinker adjustable to holes of different size. The electrode assembly includes several elliptical springs attached to collars sliding on the main stem. Each spring holds an individual conductor lead and a cutter penetrating the oil-mud film. The cutter is made of hard metal and protrudes about 3/4 inch beyond the outer face of the spring. This construction insures a sufficiently firm, sliding contact with the face of the formations for passage of the current. Research has also been made on the optimal composition of oil-base drilling fluids. - V. S.

Stephenson, E. L. Geophysical Surveys in the Ochoco Quicksilver District, Oregon; a Preliminary Report. Geol. Survey, Washington, D. C., Bull. 940-C, 1943, 98 pp. See No. 7148.

7178. Weiss, Oscar. Preliminary Observations on Apparent Electrical Resistivity Changes in Rocks under Stress and on E. M. F. Caused by Internal Friction in Rock Fracturing. Bull. Inst. Min. and Met., London, No. 462, 1943, 14 pp.

The electrical resistivity of rocks changes with an increase of physical pressure. Each type of rock has its own variation of resistivity. Origin, structure, and past history of a rock affect its resistivity. Such is



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the evidence of experiments made by the author with a view to rock-burst prediction. He finds that in the process of rock fracturing the internal friction generates an electromotive force. Witwatersrand quarzites show small impulsive deflections as the load increases, with a final large drop just before the specimen collapses. Dolomites give deflections only immediately before collapse. Fine-texture mudstone has a very small deflection on collapse. A number of load-resistivity curves of different pattern are presented and analyzed. - V. S.

7179. West, S. S. The Mutual Impedance of Collinear Grounded Wires. Geophysics, Menasha, Wis., vol..8, No. 2, 1943, pp. 157-164.

The formula of R. M. Foster for the mutual impedance of grounded wires lying on the surface of the earth has been evaluated for the case where the wires are grounded at points which are collinear and equally spaced upon the surface of a homogeneous earth. Curves are given show mutual impedance and phase shift as functions of resistivity and frequenc Author's abs.

## 5. RADIOACTIVE METHODS

7180. Copp, D. H., and Greenberg, D. M. A Mica-Window Geiger Counte Tube for Measuring Soft Radiation. Rev. Sci. Instruments, Lancas Pa., vol. 14, No. 7, 1943, pp. 205-206.

A mica-window Geiger counter tube is described which combines t speed of a metal-walled tube with a sensitivity to soft radiations compar to that of the screen-walled tubes. It consists of a $NO_2$-treated metal cylinder covered at one end by a thin sheet of mica (0.02 mm.) and at the other end by a glass bell with a central capillary. Through this capillary is sealed a piece of 8-mil tungsten wire with a drop of glass fused over the end. The tube is operated at a pressure of 10 cm. of Hg with a mixtu of 10 percent ethanol and 90 percent argon. - Author's abs.

7181. De Luca Muro, F. P. Investigacione radioactivas y mejoras en lo metodos de perfilaje. (Radioactive Investigations and Improvemen in Methods of Logging.) Bol. Inf. Petról., Buenos Aires, vol. 20, N 223, 1943, pp. 43-47

The author briefly discusses radioactivity in rocks, $\alpha$, $\beta$, and $\gamma$ rays, radioactive methods of logging, and the necessary apparatus. Exa



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of logs in the Rio Pescado Valley are presented; comparison is made between radioactive and electrical logs. The Geiger-Müller counter is outlined. There is a discussion of Amtronn's method and apparatus for measuring the ionization of the emanation content of soil gases characterizing the radium potency of upper earth formations (for details of this method see R. Ambronn, Elements of Geophysics, New York, McGraw-Hill Co., 1928, pp. 118-120). - V. S.

7182. Hurley, P. M., and Goodman, Clark. Helium-Age Measurement. I. Preliminary Magnetite Index. Bull. Geol. Soc. America, Washington, D. C., vol. 54, No. 3, 1943, pp. 305-324.

Helium age measurements on magnetite specimens of various geological ages show a grouping and sequence in accordance with geological knowledge and a spacing compatible with ideas derived from sedimentational history. Ages in millions of years are given as follows: Mean Miocene, 19; mean Laramide, 57; mean Nevadan, 118; mean late Triassic, 188; mean late Appalachian, 215; mean Devonian, 348; pre-Cambrian, ranging from 500 to 16,500. As a result the scale is considered suitable as an index for preliminary investigation of the helium retentivity of minerals and application of the method to igneous rocks. - Authors' abs.

7183. Keevil, N. B. Helium Indexes for Several Minerals and Rocks. Am. Jour. Science, New Haven. Conn., vol. 241, No. 11, 1943, pp. 680-693.

Helium indexes of a series of crystalline basic rocks are found to be fairly consistent with expected geological sequence, probably because of the high helium retentativities of the mafic constituents. Results for pre- and post-ore dikes in southern Quebec and Newfoundland suggest contemporaneous mineralization in these two widely separated deposits. Poor results were obtained with minerals at Franklin, N. J., possibly due to their complex geological history, but on the average the results agree with geological indications of a late pre-Cambrian age. Variable results were obtained with other minerals, including magnetite, and some of these are ascribed to crystal imperfections. As noted previously, rocks having glassy ground masses are of no use in geological correlation by the helium method. Author's abs.

7184. Keevil, N. B., Keevil, A. R., Ingham, W. N., and Crombie, G. P. Causes of Variations in Radioactivity Data. Am. Jour. Science, New Haven Conn., vol. 241, No. 6, 1943, pp. 345-365.



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Because of the geochemical and geothermal importance of radioactivity data, a report is made of recent observations on the variations in the radioactivity of rocks. Variations by a factor of 50 or more are sometimes found in the radioactive content from specimen to specimen. The greatest differences occur in certain granitic rocks, the least in some sedimentary sections. Regional variations are not so pronounced, but relatively highly radioactive provinces are indicated in Colorado and Great Slave- Great Bear Lakes areas and relatively barren areas in parts of Ontario and Quebec. Some laws governing the distribution of radioactive elements are indicated by the discovery that the radioactive elements are more concentrated near the border than at the core of the Bourlamaque batholith, and by additional evidence of a relationship between redioactivity and proportion of accessory minerals, chiefly spatite and zircon. Variations in the radioactivity of granitic rocks, at least, may be due entirely to differences in the amounts of such minerals in which radioactive elements are concentrated. The need for more radioactivity data is emphasized. - Author's abs.

7185. Ridland, G. C. Use of the Geiger-Müller Counter in the Search for Pitchblende-Bearing Veins at Great Bear Lake, Canada. Am. Inst. Min. and Met. Eng., New York, Tech. Pub. 1614, 1943, 7 pp.

An author's abstract of this paper has appeared in Econ. Geol., vol. 38, No. 1, 1943, pp. 88-89 (see Geophys. Abs. 112, No. 6813). - V.

7186. Sawdon, W. S. Locating Cased-Off Production by Radioactivity Logging. Petro. End., Dallas, Tex., vol. 14, No. 8, 1943, pp. 43-4

In radioactivity logging the gamma-ray curve has been supplemented recently by the neutron curve. The first curve measures the natural gamma-ray intensity of formations. The second curve indicates the effect of bombardment of formations by a neutron source within the logging apparatus. This curve discloses strata in the localities where irregularities in radioactivity make the gamma-ray curve inadequate. For example, it succeeds in some extremely radioactive sand areas in California. It can also locate porous strata in limestone in the Gulf coast and Mid-Continent. Since the chief cause of variation in the neutron curve is hydrogen, the curve does not differentiate between water and oil. The apparatus is highly sensitive to hydrogen, so that the logging should be made above the fluid level in the hole. In appearance the neutron curve is somewhat similar to the shallow resistivity curve of an electrical log, though it is a different type of measurement. - V. S.



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7187. Weltin, Hans. Soft Radiation Geiger Counter. Rev. Sci. Instruments, Lancaster, Pa., vol. 14, No. 9, 1943, p. 278.

The construction of the mica-window Geiger counter for measuring soft radiation (see No. 7180) has been simplifyed by preparing the tube from a single piece of glass. The cathode is made of a coating of Aquadag and connected by means of a platinum wire to the sealed-in tungsten lead. The Geiger counter so equipped has a plateau of 180 volts. It was still usable a year after construction. - V. S.

## 8. GEOTHERMAL METHODS

7188. Kovner, S. S. Contribution to the Foundation of the Thermal Method in Prospecting. Compt. rend. (Doklady) Acad. Sciences U.R.S.S., Moscow, vol. 37, No. 3, 1942, pp. 98-100.

This investigation shows that thermal prospecting can detect a dome of Artinskian limestone in a formation similar to that of "Second Baku" (Buguruslan district on the middle Volga). The principles of prospecting have been described previously (see Geophys. Abs. 114, No. 7066). Approximate integration by the method of nets was used to compute the thermal fields of three selected profiles. Each profile was calculated on two assumptions as to the position of the Artinskian layer: normal position and lowest possible horizontal position. Then curves were plotted for temperature differences between the assumed positions. These curves largely agree with the actual profile of the upper boundary of the Artinskian limestone, as determined by pervious investigations. The curves are shown in the text. - V. S.

7189. Kovner, S. S. Numerical Integration of Partial Differential Equations (in Russian). Trans. (Doklady) Acad. Sciences U.S.S.R., Moscow, vol. 37, No. 1, 1942, pp. 22-25.

The theory of geothermal prospecting (see Geophys. Abs. 114, No. 7066) involves the integration of partial differential equations by the method of nets. The author offers two techniques simplifying these computations. In the first, direct calculation of first differences replaces H. Leibmann's calculation of the value of functions (Sitzber. Bayer. Akad. Wiss., Munich, 1918, pp. 385-416). To justify this substitution, the computations of the values of data by both methods are compared in terms of theoretical equations and in a practical example. With reference to temperatures the



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proposed substitution means, in application to the Dirichlet problem, a change from the calculation of the thermal state in a plate with an assigned boundary temperature to the calculation of the cooling process in a plate with zero temperatures at its edges. In the second technique, by means of the described extrapolation device the first difference tables are obtained sufficiently close to the limit, and all the values of differences in them have the same sign. Thus, further computations can be made spearately for differences $A_1$ greater than zero, and for differences $A_2$ smaller than zero, so that the limit is approached simultaneous from above and below. At this stage it is possible to simplify computatio considerably by constructing a table $A_3 = (A_1 + \lambda A_2):(1 + \lambda)$, and further, if necessary, $A_4 = (A_1 + \mu A_i):(1+\mu)$, where i = 1 for negative difference and i = 2 for positive differences. This device makes it possible to deter mine the limit by five or six steps, while Liebmann's method requires many more steps. - V. S.

## 7. GEOCHEMICAL METHODS

7190. Bushnell, L. C., and Haas, H. F. The Utilization of Certain Hydro carbons by Micro-Organisms. Jour. Bacteriol., Baltimore, Md., v 41, No. 5, 1941, pp. 653-673.

Cultures of organisms growing in petroleum fractions such as petroleum ether, gasoline, kerosine, light and heavy mineral oils, and paraffin wax were isolated from oil-bearing soil, sedimentation ponds, and other sources. All Pseudomonas could utilize kerosine; bacteria of other genera were also capable of this activity, including certain specie of Micrococcus, Corynebacterium, Mycobacterium, and Proactinomyces The R. Q. of various bacterial cultures on different hydrocarbons varied from 0.3 to 0.7 - L. D. Bushnell, Biolog. Abs., vol. 15, No. 8, 1941, entr 18971; condensed by V. S.

7191. Collins, J. H. Bacteria Make Good Oil Prospectors. Petrol. Wor Los Angeles, Calif., vol. 40, No. 8, 1943, pp. 46-50.

In bacteriological prospecting it is necessary to look for the products of bacterial action on three petroleum gases - ethane, propane, ar butane. At first the field holes can be run in a straight line across the tract, with a back-and-forth checking; it may be sufficient to dig one or two holes per acre. Gradually a pettern may be discovered and clarifie by more drilling. One part of gas in 100,000,000 parts of air is sufficie



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for a bacteriological analysis. L. W. Blau offered one such test (U. S. Patent 2,269,889); R. T. Sanderson, another test (U. S. Patent 2,294,425). In his work for the A.P.I. Research Project 43, Scripps Institution, C. E. ZoBell has discovered improved ways of cultivating soil bacteria which oxidize petroleum hydrocarbons. He now seeks to develop a method of detecting the presence of such bacteria, or of their end products, in field samples for a use in oil prospecting. Two men in the field should be able to take several dozen samples a day, covering eighty acres. Thus, it would be possible to explore very large areas quickly and cheaply. - V.S.

7192. Stone, R. W., Fenske, M. R., and White, A. G. C. Bacteria Attacking Petroleum and Oil Fractions. Jour. Bacteriol., Baltimore, Md., vol. 44, No. 2, 1942, pp. 169-178.

Bacterial cultures capable of attacking crude oil, lubricating oils, vaseline, asphalt, and all other petroleum fractions were isolated from soil. The organisms found were all gram-negative rods, including Pseudomonas and many white-mucoid types. The break-down of oil was accompanied by an up-take of oxygen, high bacterial count, emulsification, and sometimes a decrease in pH. - R. W. Stone, Biolog. Abs., vol. 16, No. 6, 1942, entry 22807; condensed by V. S.

7193. ZoBell, C. E. Studies on the Bacterial Flora of Marine Bottom Sediments. Jour. Sedimentary Petrol., Madison, Wis., vol. 8, No. 1, 1938, pp. 10-18.

The bacteriological analysis of 126 sediment samples collected along the coast of southern California from bottoms as deep as 2,000 meters reveals the presence of several types of bacteria. The chief factors influencing the bacterial population are the particle size of sediments, organic-matter content, and core depth. Bacteria which decompose proteins, cellulose, starch, chitin, and other complex organic compounds are quite abundant in the botton deposits. The author concludes that the occurrence of lipoclastic species which utilize the glycerol from fats and leave long-chain fatty acids may help account for the genesis of petroleum. - Author's abs., condensed by V. S.

7194. Zobell, C. E., Grant, C. W., and Haas, H. F. Marine Microorganisms Which Oxidize Petroleum Hydrocarbons. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol 27, No. 9, 1943, pp. 1175-1193.

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Certain bacteria can oxidize petroleum ether, methane, pentane hexane, and many other hydrocarbons. They are species of Proactinomyces, Actinomyces, Pseudomonas, Micromonospora, etc., found in the sea. All samples of sediments, regardless of distance from land, water depth, or core depth, have shown the presence of these bacteria. Most of them oxidize hydrocarbons only in the presence of free oxygen, although some of them can utilize nitrate, or possibly sulfate, as hydrogen acceptor. Within limits, long-chain hydrocarbons are oxidized more readily than those of smaller molecular weight. Compounds with unsaturated bonds are attacked in preference to saturated compounds. Although the reaction will take place in an aqueous system, the presence of sand, silt, and other inert absorbents accelerates oxidation. The activity of hydrocarbon-oxidizing bacteria may account for the failure of certain workers to find petroleum hydrocarbons in sediment samples. - Authors' abs., condensed by V. S.

## 8. UNCLASSIFIED METHODS AND TOPICS RELATED TO GEOPHYSICS

7195. American Institute of Mining and Metallurgical Engineers. The Professional Training of Geophysicists, Report of Geophysics Education Committee of Mineral Industry Education Division, A.I.M.E. Tech. Pub. 1633, Class J. Mineral Industry Education Division, No. 18, New York, 1943, 19 pp.

The Geophysics Education Committee has devoted several years to a consideration of the problem of training geophysicists. Previous repo have been fact finding (see Geophys. Abs. 108, No. 6439). The present report proposes the following curriculum: (1) MATHEMATICS: Algebra plane and spherical trigonometry, analytical geometry, calculus, differential equations, complex variables; (2) PHYSICS: General physics, analytical mechanics, heat and kinetic theory, electricity and magnetism, vector and tensor analysis, probability and measurements, potential theo solid and fluid mechanics, thermodynamics, A. C. theory, electronics, optics, radioactivity, electromagnetic theory; (3) CHEMISTRY: Genera chemistry, analytical chemistry, physical chemistry; (4) GEOPHYSICS: Elementary geophysics, intermediate geophysics, physics of fluid earth, chemistry of earth, terrestrial electricity and magnetics, earth thermodynamics: (5) GEOLOGY: General geology, field course, crystallograph and mineralogy, stratigraphy and paleontology, petrography; (6) ENGINE ING: Shop work, drafting, descriptive geometry, surveying; and (7) MISC LANEOUS: Geography, biological science, languages, etc. The commit recommends that such a curriculum be offered by separate and indepen departments of geophysics having staffs, equipment, and budgets compar



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to those of the other departments in the universities. A discussion accompanies the report. C. H. Behre thinks that requirements as to curriculum, staff, and academic background should be lowered. C. A. Heiland distinguishes between geophysical science and geophysical exploration and advocates a curriculum more adapted to exploration; such a curriculum is outlined. S. F. Kelly stresses the need of a scientific background for geophysical exploration and the flexibility of the committee's curriculum. W. R. Chedsey points out that the committee's curriculum emphasises basic sciences in agreement with the views expressed at the meetings. - V. S.

7126. Blau, L. W. Geophysics, Geochemistry, and the Practical Man. Min. and Met., New York, vol. 24, No. 441, 1943, pp. 396-397.

Practical oil men sometimes are skeptical of geophysical methods, considering them to be too theoretical. The writer seeks to overcome this prejudice by circumscribing the various activities entering into exploration. The functions of geophysics and geochemistry in petroleum engineering are to determine geological structure, location of producing horizons, liquid levels in boreholes, etc. Geophysicists do electrical and radioactive logging, acoustic logging, hole-diameter measurement, liquid-level determination, and perforating. Geochemists are concerned with reservoir operations, geochemical logging, and mud logging. This demarcation leaves to petroleum engineers drilling, mud control, and transportation. - V. S.

7127. Brant, Arthur. Aerial Geophysical Prospecting. Canadian Min. and Met. Bull., Montreal, No. 376, 1943, pp. 395-396.

Geophysical exploration can be made from airplanes. The author discusses briefly such a possibility for the magnetic, electromagnetic and gravimetric methods. For each of these methods he outlines: (1) Theoretical basis, (2) apparatus, and (3) limitations; further comments are added in some cases. A more complete treatment is promised in a forthcoming paper. - V. S.

7128. Daly, R. A. Meteorites and an Earth Model. Bull. Geol. Soc. America, Washington, D. C., vol. 54, No. 3, 1943, pp. 401-456.

The author discusses the old hypothesis that the earth represents meteoritic material. With Jeffreys he assumes the planet to have been initially gaseous, with a mean temperature well above the boiling point of iron, namely 3,000°. A large part - perhaps much more than half - of the



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original body of gas may have been lost to space because of volatility at the high temperature. Condensation of the residual gas to liquid and differentiation in both the gaseous and liquid states occurred, but by processes significantly different from those pictured by Jeffreys. The suggested course of development gives an existing earth which has the following succession from surface to center: a true crust, the lithosphe a thicker, vitreous asthenospheric shell; a still thicker, crystallized me spheric shell; and a nickel-iron core, probably fluid and possibly behavi much like a gas.

The paper summarizes the principal observed facts about the natu of meteoritic stones and irons, and the reasons for supposing them to be fragments of a disrupted parental planet. A cause for this disruption and therewith explanation for some of the general characteristics of meteorites are briefly discussed. After comparison between earth and parental planet, the imagined evolution of the earth is tested by referenc to the terrestrial discontinuities, mean density, moment of inertia, radi activity, and plasticity. Rough estimates of temperatures in depth and degrees of strength of the materials in depth are deduced. - Author's a

7199. Fleming, J. A. The American Geophysical Union. Science, Lancaster, Pa., vol. 97, No. 2530, 1943, pp. 565-568.

A description is given of the organization of the American Geophy sical Union, the resolutions and discussions at the twenty-fourth annual meeting, the election of officers, financial statement, international affil ations and activities, the membership and work of the International Commission on Continental and Oceanic Structure, and the responsibilit of American geophysicists during and after the war. - V. S.

7200. Gabriel, V. G. Geophysical Methods Defined. Petrol. World, Lo Angeles, Calif., vol. 40, No. 10, 1943, pp. 28-29, 47.

The author briefly outlines the major geophysical methods: Seism electric, gravitational, magnetic, geothermal, radioactive, and geochem He states that for the United States as a whole, wild-cat wells drilled on the structures recommended by geophysicists and geologists are four ti more successful than those drilled without the application of geophysics California shows a ratio even more favorable to geophysics. About $30,000,000 is spent annually in the United States on geophysical explor for oil alone. - V. S.



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7201. Goldstone, F. Maintaining an Adequate Level of Geophysical Exploration. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 27, No. 7, 1943, pp. 948-953; Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 237-243.

This article appeared in The Oil and Gas Journal, Tulsa, Okla., vol. 41, No. 48, 1943, pp. 56-61 (see Geophys. Abs. 113, No. 6946).-V. S.

7202. Heiland, C. A. War Affects Geophysical Activity: More Recent Developments Reviewed. South African Min. and Eng. Jour., Johannesburg, vol. 54, No. 2633, 1943, pp. 435-437.

In the year 1942 geophysical activity was curtailed by war, but much previous work came to fruition. (1) In gravimeter prospecting the instruments and techniques were perfected. Some investigators worked to improve the Bouguer and tidal corrections. An integraph for the evalution of the effects of assumed subsurface features was developed. A simplification in torsion-balance techneque was proposed for measuring vertical and horizontal gravity gradients at right angles to the strike. (2) In magnetic prospecting refinements of measurements were obtained in connection with military uses. (3) Seismic reflection mapping continued to occupy the most prominent place in oil exploration. Improvements were attained in manual and automatic gain controls, filter combinations, and controlled feed-over between channels. Studies were conducted of the transient behavior and limiting sensitivity of seismograph, the explosion of dynamite charges, the curved-ray analysis, and mechanical devices to facilitate curved-ray interpretation. (4) In electrical logging there were detailed studies of the distribution of radioactive substances in sedimentary formations. Improvements were attained in radioactive measurements; the Schlumberger self-potential dipmeter was the most significant development in this work. (5) Geochemical prospecting was promoted by the application of the microbiological principle. In addition to the above mentioned developments the paper reviews field-prospecting for oil, search for strategic materials, and geophysical education. - V. S.

7203. Howard, W. V. Geologists survey Needs for Increased Discovery Rate. Oil and Gas Jour., Tulsa, Okla., vol. 40, No. 50, 1942, pp. 43-45, 46.

This article covers the survey of oil discovery methods summarized by the A. A. P. G. Research Committee for the introductory evening session of the annual convention in Denver, Colo. The project under the chairmanship of A. I. Levorsen covered philosophical considerations,



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geology, stratigraphy and sedimentation, research, geophysics, geochemistry, and other topics. - D. W., Mines Mag., vol. 33, No. 4, 1943.

7204. Levorsen, A. I. Discovery Thinking. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla,, vol. 27, No. 7, 1943, pp. 887-928.

This article appeared in The Oil Weekly, Houston, Tex., vol. 109, No. 6, pp. 11-17, 26; No. 7, pp. 14-17, 20; No. 8, pp. 12-13, 26-28; 1943 (see Geophys. Abs. 113, No. 6952). An abridged version appeared in The Oil and Gas Journal, Tulsa, Okla., vol. 41, No. 48, 1943, pp. 38-39, 42-46. - V. S.

7205. Parsons, C. P. Further Developments in Caliper Logging (Abs.). Oil Weekly, Houston, Tex., vol. 109, No. 10, 1943, p. 54.

Caliper logging is discussed in relation to: (1) Setting surface casing, particularly in deep wells where the possibility of a blow-out is great; (2) application of permeability characteristics to geological correlation; (3) the relation between mud-cake thickness and permeability; experiments are described; (4) the effects of acidizing, especially to learn whether the acid had penetrated the type of formation desired; and (5) determination of erosion by the mud-stream. - V. S.

7206. Schnellmann, G. A. The Structural Homogeneity of Some British Mining Fields. Min. Mag., London, vol. 69, No. 1, 1943, pp. 9-14.

Five notable British lead-zinc mining areas were compared and shown to have identical geological structures. This identity is discussed as a basis for exploration. The contention is made that a comparative analysis of fields to discover their common characteristics carries possibilities of ore finding. Admittedly, objections may be raised against the implication that any area possessing structural features common to productive fields is a potential ore locus. Strictly speaking, promising structures should stand in suitable relations to source cupolas. Yet, none of the compared mining areas are demonstrably related to cupolas. An igneous source is not observed, but only inferred from the presence and nature of the ore bodies; if it exists, it must be very deep-seated. However, generally speaking, an interdependence between domes and source cupolas is quite conceivable; in Cornwall each of the five granite masses is the core of a dome. - V. S.



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7267. Taylor, Frank B. Some Approaches to Development of Better Oil Finding Tools. Oil Weekly, Houston, Tex., vol. 111, No. 1, 1943, pp. 82-90.

The writer describes the improvements in existing geophysical methods and the search for new methods. (1) In seismic prospecting, it is now possible to make multistage records and records of different frequencies; refraction surveys can obtain records of secondary arrivals for areas of unconsolidated sands. There are also improvements in shots, receivers, and records. (2) In gravimetric and magnetic prospecting, more stations are made, quicker results are secured, and greater details are possible. The gravimeter and the magnetometer have been perfected. (3) Stratigraphic drills have been improved so that deeper coring is possible. Slim-hole drilling affords the most important method of searching for stratigraphic traps. (4) In core analysis more accurate, economic, and speedier ways have been devised, coring equipment has been perfected, and tests are made of new methods, in part secretly. (4) In geodynamic prospecting, the undisturbed rate of gas diffusion is measured throughout a given surface area. Use is made of bacteria found near petroleum wax. A type of mud analysis aims to employ ultra-violet light to produce fluorescence. Some other lines of research are likewise mentioned in the paper. - V. S.

7268. Tiratsoo, E. N. The Origin of Petroleum. Petroleum, London, vol. 6, No. 1, 1943, pp. 7-9, 12.

In spite of the sifting of evidence which has gone on uninterruptedly for the better part of a century the origin and process of formation of petroleum still offer a field for speculation. The theories advanced from time to time are here summarized, with a statement of the objections raised to each theory, leading to the conclusion that thouugh an animal origin is the more likely, vegetable life may have contributed to the source material, formed in a marine environment. Support is given by the author to the theory that the process of formation of petroleum from this material may have been one involving the action upon it of $\alpha$-radiation. - Author's abs.

7269. Uren, L. C. Inspection and Analysis of Formation Samples: Selection and Preparation of Formation Samples for Laboratory Inspection. Petrol. Eng., Dallas, Tex., vol. 14, No. 7, 1943, pp. 72-76.

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This article is the first of a series. It deals with the selection and preparation of formation samples for laboratory inspection. Samples ca be classified into types according to modes of drilling; different types have unequal value for analysis. In cable drilling 12 types are describe In rotary drilling the returns are so disintegrated that coring tools must be used. The merits of several coring instruments are discussed. In th process of coring the samples often undergo destructive alterations; some causes are indicated. On reaching the surface a core is reassemb on a tray, observations are made of the apparent fluid content of differe strata, and measurements are taken to the top and bottom of each stratu A selection is then made of cores representative of strata. Inasmuch as the laboratory analysis includes tests for porosity, permeability, fluid content, etc., portions of the core must be chosen for these tests and cu or dressed to suitable form, depending on the apparatus. Some specime are treated further with solvents required by the tests. - V. S.

7210. Uren, L. C. Inspection and Analysis of Formation Samples: Determination of Fluid Content and Permeability of Core Samples by Quantitative Laboratory Tests. Petrol. Eng., Dallas, Tex., vol 14, No. 8, 1943, pp. 62-72.

This article is the second of a series. It explains methods of making permeability tests and determining the fluid content of samples (1) The permeability test measures the quantity of fluid passing throug a sample per unit of time under controlled pressure. The tests require samples from which fluids and soluble residues have been removed by heat or solvents. Extraction can be made by means of the Soxhlet appa ratus. Permeameters, laboratory techniques, and the "Darcy" units o permeability are discussed. (2) The fluid content of a sample is meas by weighing the core specimen before and after the extraction of fluid. When porosity is known, the average saturation may be computed. Methods are described for determining water saturation, connate water salinity, oil saturation, and oil gravity. A comprehensive bibliography on permeability and fluid content is appended. - V. S.

7211. Uren, L. C. Inspection and Analysis of Formation Samples: Determination of Porosity and Grain-Size Distribution. Petrol. Eng., Dallas, Tex., vol. 14, No. 9, 1943, pp. 51-60

This article is the third of a series. It is devoted to methods of determining porosity and grain-size distribution in formation samples. (1) The porosity of a rock specimen is defined as the ratio of the aggr volume of its void pore spaces to its gross bulk volume. Bulk volume



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be measured by several methods: Mercury displacement, fluid displacement of a saturated specimen, paraffin coating and weighing in air and water, dimensional measurements, and a determination from weight, specific gravity, and pore volume. Pore volume is measured indirectly by determining the volume of the mineral substance. This can be done by gas displacement, use of liquids of known density, crushing the specimen and weighing its grains, and a dividing of total weight by specific gravity. The methods are described. (2) Grain-size distribution in samples is determined by disaggregating specimens without crushing the grains. The percentages, by weight, of granular fragments segregated within different size ranges indicate the grain-size distribution. The steps of disaggregation, leaching with solvents, and screen sizing are described. Alternative methods of size classification include elutriation and rate of settling in water. - V. S.

7212. Uren, L. C. Inspection and Analysis of Formation Samples: Orientation of Cores; Segregation and Identification of Mineral Components and Micro-Fossils in Formation Samples. Petrol. Eng. Dallas, Tex., vol. 14, No. 12, 1943, pp. 53-58.

This article is the fourth of a series. It deals with the orientation of core samples for determining the inclination of strata; and the segregation and identification of mineral and fossil components of samples for correlating strata. (1) The Orientation of cores can be made by utilizing their magnetic polarity. The crystals of rocks freed by weathering are deposited in sedimentary formations with their poles in the magnetic meridian. Formation cores thus possess distinct polarity. By means of this polarity it is possible to orient the cores in their original position in the earth. Success depends upon the amount of magnetic material in the cores. An apparatus has been devised by the Standard Oil Co. of California for orientation. (2) The segregation of mineral components of cores for identification can be accomplished by means of the following concentration techniques: (a) Heavy mineral concentration by gravitational segregation with the aid of heavy liquids; (b) magnetic separation of minerals possessing magnetic succeptibility; (c) dielectric separation of minerals; and (d) electrostatic separation. These techniques are described. Microfossils found in samples of sedimentary origin can be identified by microscopic study. - V. S.

7213. Weaver, Paul. The Geophysicist as a Forecaster. Geophysics, Menasha, Wis., vo. 8, No. 3, 1943, pp. 273-289.



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The commercial geophysicist has hitherto been little concerned with a realm of geophysics which deals with the detection of nonequilibrium by measuring the time rate of change of a physical property in a localized area, in order to forecast when a critical point will appear in the system, and what magnitude of transition is probable. The author has selected some examples of such geophysical problems, which he considers of great economic importance, and which would appear amenable to our present technique or to some modification thereof. There are discussed: (1) Artificial nonequilibrium: wells, mines and quarries, extraction of underground fluids; and (2) Natural nonequilibrium: weather, particularly fog, earthquakes and landslides, volcanoes. - Author's abs.

7214. Yacimientos Petróliferos Fiscales, Dirección General. Memoria de Y. P. F. del Ano 1941 (Report of the Argentine General Administration of Government Oil Fields for the Year 1941). Bol. Inf. Petról., Buenos Aires, vol. 19, No. 216, 1942, pp. 13-15.

During the period 1940-41 geophysical exploration in Argentina was conducted in the Provinces Salta, Mendoza, San Juan, Chaco, and Neuquén. Torsion-balance and gravimetric surveys predominated in the plains; gravimetric surveys alone were made in mountainous country. In locations requiring more detailed data the seismic method was used. Various anomalies were discovered. The work is described for each Province; the extent of the areas surveyed is indicated in square kilometers. - V. S.

## 9. NEW PUBLICATIONS

7215. American Institute of Mining and Metallurgical Engineers, Petroleum Division. Petroleum Development and Technology. Trans. Am. Inst. Min. and Met. Eng., New York, vol. 151, 1943, 301 pp. Price, $5.00.

This volume is the eighteenth of the Petroleum Development and Technology series of the Petroleum Division of A.I.M.E. It contains papers and discussions presented before the Division at meetings held at New York, February 9-12, 1942; Los Angeles, October 15-16, 1942 and Austin, October 29-31, 1942; Also the petroleum statistical reports covering the year 1942. There are six chapters devoted respectively to (1) Production Engineering, (2) Engineering Research, (3) Geophysical Exploration, (4) Petroleum Economics, (5) Production, and (6) Refining. - Bull. Am. Assoc. Petrol. Geol., vol. 27, No. 9, 1943, p. 1271.



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7216. Anderson, E. M. The Dynamics of Faulting and Dyke Formation, with Application to Britain. London, Oliver & Boyd, 1942, 191 pp., 38 figs. Price, 15 s.

Faults and dikes are particularly well represented in Britain so that the island offers a good opportunity for their study. The dynamics of the earth crust is analyzed in terms of an ideal state serving as the standard of reference; therein the lateral pressure from all sides increases steadily with depth, in order to equal the vertical pressure everywhere. Faulting and dike formation are viewed as departures from this state. Although the author's reasoning is partly deductive, there are constant references to factual observations. The book contains eight chapters supplied with bibliographies. The terminology is simple throughout the text. - C. R. Longwell, Econ. Geol., vol. 38, No. 5, 1943, pp. 423-425; condensed by V. S.

7217. Institution of Petroleum Technologists. Petroleum: Twenty-Five Years Retrospect, 1910-35. London, 219 pp., 46 ills.

The Institution of Petroleum Technologists, London, has published a review of advances in petroleum science from 1910-35. Various contributors have outlined technical developments in petroleum economics, geology, prospecting, geophysics, drilling, production engineering, distillation, cracking, refining and treatment, transportation and storage, ocean transport, storage installations, distribution of petroleum products, chemistry of petroleum, tests of petroleum and their standardization, fuel development for internal-combustion engines, natural gas, chemical intermediates and special products, asphaltic bitumen and asphalt, Scottish shale-oil industry, and production of oil from coal. - V. S.

7218. Nevin, C. M. Principles of Structural Geology, 3d ed., New York, Wiley & Sons, 1942, 320 pp., 165 figs. Price, $3.50.

The first edition of this textbook was published in 1931. The present edition is considerably revised. The chapter on faults shows additions and improvements which do not alter its theoretical character. The chapter on igneous structures, written by E. B. Mayo, has been somewhat modified; but it still leaves the impression that differential movement in flow is due to the sideward pull of the channel walls. The chapter on structures in unconsolidated sediments amplifies the discussion of the role of gravitational compaction in the dewatering of sediments. The other chapters which deal with the constitution of the earth, continents and ocean basins, isostasy, orogenic movements, etc., have also been modified and somewhat expanded. - E. Bliss Knopf, Am. Jour. Science, vol. 241, No. 9, 1943, pp. 596-598; condensed by V. S.

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7219. Newmark, Maxim. Dictionary of Science and Technology in English-French-German-Spanish, 386 pp. Printed in the United States by East Printing Co., Inc., New York, for the Philosophical Library, Inc., 15 East 40th Street, New York, N. Y. Price, $6.00.

This dictionary is designed to assist readers of foreign texts deali with the physical sciences and their applied fields. It gives French, German, and Spanish equivalents for some 10,000 current technical term in English. Subjects of interest to geophysicists include radio theory an technology, meteorology, chemistry, physics, electrical physics, surveyi and machineshop practice. The entries are arranged alphabetically, and each entry is numbered. Separate indexes of French, German, and Spani terms, correspondingly numbered, permit a two-way use of any one of these languages with the English. The author has included new terms brought into existence by the war. - V. S.

7220. Van Tuyl, F. M., and others. Review of Petroleum Geology in 1942. Colorado Sch. Mines Quart., Golden, Colo., vol. 38, No. 3, 1943, 75 pp. Price, $1.00

This review was prepared by the staff of the Colorado School of Mines. It constitutes the first report in the series inaugurated in 1942 b the research committee of the American Association of Petroleum Geologists. The sections bear the following titles: Important Events of the Year, Advances in Petroleum Geology and Allied Subjects, Aerial Photographs, Miscellaneous New and Improved Techniques, Noteworthy Discoveries (of petroleum deposits), Contributions of Petroleum Geology to Pure Geology, Production and Reserves and Trends in Petroleum Geol and Geophysics. A considerable geological literature is surveyed, and a comprehensive bibliography is appended. - J. L. Ferguson, Bull. Am. As Petrol. Geol., vol. 27, No. 8, 1943, pp. 1164-1165; condensed by V. S.

## 10. PATENTS

7221. Gain Control; B. E. Moritz, Jr., Houston, Tex., assignor to Stanol Oil & Gas Co., Tulsa, Okla., a corporation of Delaware. U. S. Pat 2,316,354, issued April 13, 1943.

Apparatus for seismic surveying comprising means for generatin seismic waves, a seismometer, an amplifier associated with said seism meter, said amplifier including a variable gain section, a recorder actu by said seismometer through said amplifier, means for changing the gai of said variable gain section of said amplifier solely in the direction of



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increasing gain, means responsive to the average amplitude of the signals passing the output of said amplifier for varying the rate of change of said variation in gain, and means responsive to the operation of said first-mentioned means and operative a predetermined time after the operation of said first-mentioned means for initiating the action of said last-mentioned means at a time interval after the arrival of the first of said signals at amplifier. - Claims allowed, 8.

7222. Vibration Responsive Device; F. K. Powell, Schenectady, N. Y., assignor to General Electric Co., a corporation of New York. U. S. Patent 2,316,616, issued April 13, 1943.

A vibration-velocity responsive (horizontal-component permanent-magnet) device comprising a shell of magnetizable material with a substantially concentric center rod mounted in the shell, a permanent magnet unit mounted on said center rod with substantially cylindrical pole pieces having cylindrical surfaces spaced from the inner surface of said shell to form a pair of annular air gaps, an electrical winding structure including a pair of current-conducting coils within said air gaps, and a resilient mounting for said winding structure providing stiffness with respect to transverse motion and resilience with respect to relative axial motion between the electrical winding structure and the permanent-magnet pole pieces. - Claims allowed, 5.

7223. Apparatus for Amplifying and Measuring Small Displacements; O. H. Truman, Salt Lake City, Utah. U. S Patent 2,316,915, issued April 20, 1943.

In apparatus for amplifying and measuring minute displacements (usable as an indicating device for a gravimeter), the combination of an electrical resonant circuit which includes a capacitance which is variable in response to the displacement to produce a current flow in said circuit which is a function of the displacement, and a potentiometer circuit operatively connected with the capacitance of the resonant circuit for normalizing the capacitance of the latter circuit, said potentiometer circuit including means for measuring the normalizing effect thereof as a function of the displacement. - Claims allowed, 12.

7224. Automatic Volume Control for Recorder Amplifiers; O. S. Petty and J. O. Parr, Jr., San Antonio, Tex.; said Parr assignor to said Petty. U. S. Patent 2,318,624, issued May 11, 1943.



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In an amplifier for use between a seismic wave detector and a recorder, the combination of a plurality of thermionic tubes, means associating said tubes for cascade seismic frequency amplification, an automatic volume control tube responsive to the output of one of said tubes, means associating said A. V. C. tube with one of said amplifier tubes to control the gain of the latter, and means to prevent blocking of a subsequent tube only in said cascade by the signals flowing thereto, said means being limited to operations when the signals applied thereto exceed a predetermined threshold value. - Claims allowed, 16.

7225. Measuring Device; F. G. Boucher, Tulsa, Okla., assignor to Standar Oil Development Co., a corporation of Deleware. U. S. Patent 2,318,665, issued May 11, 1943.

In a system for measuring a force acting torsionally on a helical torsion spring having an anchored end and an end subjected to said force, means for applying to a turn of said spring at a point closer to the anchore end than to the other end thereof a second force in opposition to said first mentioned force and means to indicate a value proportional to the amount of said second mentioned force. - Claims allowed, 4.

7226. Signal Controlled Amplifier; Le Roy C. Paslay, Chicago, Ill., assignor to National Geophysical Co., a corporation of Deleware. U. S. Patent 2,319,626, issued May 18,1943.

An electronic (seismograph) amplifier adapted to maintain a substantially constant output when the mean signal input thereto varies substantially unidirectionally through a wide range during an interval of time, including: An amplifier having at least two tubes in cascade; means independent of said signal for automatically varying the gain of at least one tube inversely to said input during said interval; and means for varying the gain of at least one succeeding tube inversely to said signal variation. - Claims allowed, 12.

7227. Gravitational Force Measuring Apparatus; W. A. Marrison, Maplewood, N. J., Assignor to Bell Telephone Laboratories, Inc., New Yor a corporation of New York. U. S. Patent 2,319,940, issued May 25, 1943.

A device for indicating gravitational effects comprising a rotating element, constant-speed means for driving said element, a column of liqui carried by the rotating element near its axis of rotation, a second column



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of liquid carried by the element at a peripheral point remote from the axis, a liquid-conveying conduit connecting the columns, and means responsive to the difference in heights of said columns when the element is rotating for indicating the gravitational force exerted upon the liquid. - Claims allowed, 16.

7228. Well-Surveying Method and Apparatus; Jacob Neufeld, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,320,643, issued June 1, 1943.

Method of geophysical prospecting that comprises placing quantities of radiation-emitting material within a frangible envelope at selected locations within the locality being studied, permitting the material to distribute itself within the locality in a manner related to a significant geological characteristic thereof, and detecting variations in said characteristics by measuring radiation in said locality. - Claims allowed, 5.

7229. Method of Analyzing Earth Formations; H. H. Thompson, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,320,681, issued June 1, 1943.

In a method of well logging wherein a plurality of samples of earth formations are taken at a plurality of vertically spaced points, the improvement comprising treating at least a portion of each of said samples with a liquid of known density, recovering at least a portion of each of said liquids, separately determining the pressure change necessary to render the apparent density of the recovered equivalent to the initial known density of the treating liquid. - Claims allowed, 3.

7230. Well-Surveying Method and Apparatus; W. G. Green, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,320,863, issued June 1, 1943.

A device for cable suspension within a deep-well bore for locating the well bottom which comprises, a fluid-tight hollow capsule, electrical means within said capsule for transmitting a signal to a point exterior of the well bore, a normally open switch also within the capsule for controlling operation of said electrical means, an armature carried by said switch, said armature being interiorly supported from the capsule in proximity to the bottom wall thereof, magnetic means located wholly exteriorly of said capsule and means for supporting said magnetic means from said capsule for vertical sliding movement therebeneath, whereby



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when the magnetic means strikes the botton of the well it is displaced upwardly toward the armature to increase the lines of force acting thereon sufficiently to cause the switch to be closed. - Claims allowed, 1.

7231. Method of Geophysical Prospecting; W. L. Russell, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware: U. S. Patent 2,320,890, issued June 1, 1943.

Method of geophysical prospecting that comprises positioning at preselected irregularly spaced locations within a well, casing units individually possessing radiation emissive characteristics capable of detection by a radiation sensitive prospecting instrument in the immediate vicinity thereof, and logging the well with a radiation sensitive prospecting instrument. - Claims allowed, 2.

7232. Method of Geophysical Prospecting; S. A. Scherbatskoy and R. E. Fearon, Tulsa, Okla., assignors to Well Surveys, Inc., Tulsa, Okla. a corporation of Deleware: U. S. Patent 2,320,892, issued June 1, 1943.

A method of locating cement behind a casing in a well that comprises making layers of radioactive cement separated by layers of nonradioactive cement, said nonradioactive cement layers being formed of measured quantities of cement, and determining the location of said radioactive layers - Claims allowed, 8.

7233. Apparatus for Measuring Pressures in Containers; G. L. Hassler Berkeley, Calif., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware. U. S. Patent 2,321,293, issued June 8, 1943.

For use in (geochemical prospecting) in combination with a plurality of sealed-gas containers each having a valved outlet, single means for consecutively measuring the pressure in said containers, said means comprising a tube of small volumetric capacity fluid-tight clamping means for fixing one end of said tube in register with the valved outlet of one of said containers, a closed vessel partially filled with liquid sealed about the other end of said tube, said other end extending into vessel below the surface of said liquid, a source of gaseous pressure, a conduit in communication between said source and the space above the liquid surface in said vessel valve means in said conduit for applying a controlled gaseous pressure from said source to said vessel, whereby said liquid is caused to enter t



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tube immersed therein to a predetermined level, and manometer means connected to said conduit in parallel with said vessel for indicating the gaseous pressure applied thereto when the liquid reaches said level. - Claims allowed, 2.

7264. Apparatus for Logging Boreholes; L. G. Howell, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,321,295, issued June 8, 1943.

An apparatus for logging boreholes comprising a Geiger-Müller counter adapted to be lowered into a borehole, a source of D. C. power at the surface for operating said Geiger-Müller counter, a single-conductor cable for conducting said D. C. power from the surface to said counter, means arranged in the circuit between said source of power and said counter and adapted to move with the counter for stepping up the voltage supplied by said D. C. source to the value required for operation of said counter, means connecting the output of said counter to said single-conductor cable, means at the surface for separating the output pulses of the counter from the applied D. C., and means at the surface for recording the output pulses of said counter. - Claims allowed, 5.

7265. Seismic Surveying; B. B. Weatherby, Tulsa, Okla., and W. T. Born, Bloomfield, N. J., assignors to Geophysical Research Corporation, New York, N. Y., a corporation of New Jersey. U. S. Patent 2,321,341, issued June 8, 1943.

In seismic prospecting apparatus for receiving seismic waves, the amplitudes of which decrease as a function of time, means for converting said waves into electrical pulsations of corresponding magnitude and conducting said pulsations to a recorder responsive to the amplitudes of the pulsations, means associated with said recorder for initially reducing its responsiveness to said pulsations below its normal response and then increasing its response to said pulsations at a rate which is in substantially inverse proportion to the rate of decrease of the amplitudes of said waves, whereby the amplitude of the recorded waves is maintained substantially constant. - Claims allowed, 16.

7266. Seismic Surveying; L. F. Athy and E. V. McCollum, Ponca City, Okla., assignors to Continental Oil Co., Ponca City, Okla., a corporation of Delaware. U. S. Patent 2,321,450, issued June 8, 1943.



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The method of profiling at least one subsurface stratum, which comprises producing seismic waves at a first source, receiving seismic waves from said first source after reflection from said stratum at two or more reception points spaced from said source and out of line therewith, recording the effects of said seismic waves as a plurality of traces on a common record; producing seismic waves at a second source spaced from said first source and out of line with said reception points, receiving seismic waves from said second source after reflection from said stratum at said reception points, and recording the effects of said last mentioned seismic waves as a plurality of traces on a second common record, the length of the reflected wave path between said first source and one of said reception points being substantially the same as the length of the reflected wave path between said second source and the other of said reception points, and said two reflected wave paths having substantially identical reflection points on said subsurface stratum. - Claims allowed, 2

7237. Coring Device; Benjamin W. Sewell, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,322,064, issued June 15, 1943.

A pressure-coring device comprising a cutting head adapted to cut a core and having a central passage adapted to receive the core, a core-receiving barrel arranged behind said cutter head adapted to assume a forward position and a retracted position and arranged for communication with said passage when in its forward position, means for holding said barrel in its forward position during the coring operation, means operable by a falling weight to move said barrel to its retracted position upon completion of the coring operation, and means operable upon removal of said barrel to its retracted position for sealing said barrel under the pressure of the formation cored. - Claims allowed, 3.

7238. Well-Surveying Method and Apparatus; Serge A. Scherbatskoy, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,322,478, issued June 22, 1943.

Apparatus to measure rate of drilling of a well bore that comprises means for generating a first series of uniformly pulsating electrical signals, means for generating a second series of electrical signals corresponding to unit increments of drilling; means actuated by said second series of electrical signals in accordance with the number of units of depth drilled, means actuated in accordance with the number of said electrical signals occurring during the time required to progress said units of depth, means for interrupting both of said series of electrical signals; means movable



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in accordance with the depth of the drilling operations; and means for recording the number of units of depth drilled and the number of said timing signals in correlation with depth. - Claims allowed, 3.

7139. Leveling Device; F. G. Boucher, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,323,615, issued June 22, 1943.

A (gravity meter sub-base) device for leveling and supporting instruments comprising, in combination, a member having an upper surface in the shape of a portion of a sphere and a lower portion adapted to rest on an irregular surface, a second member arranged to carry an instrument, and means for supporting said second member on said first member consisting of three equidistantly spaced downwardly extending leveling screws attached to the lower surface of said member, a gripping cup secured to each leveling screw, each gripping cup being provided with a lower plane surface with a rubber ring secured thereto, and a ball and socket joint connecting the upper end of each gripping cup with its corresponding adjusting screw. - Claims allowed, 3.

7140. Method and Apparatus for Logging Boreholes; L. G. Howell and L. W. Blau, Houston, Tex., assignors to Standard Oil Development Co., a corporation of Deleware. U. S. Patent 2,322,634, issued June 22, 1943.

A method for determining the distribution of radioactive material around a borehole, which comprises making a plurality of radioactive measurements inside the borehole, each measurement being confined to a selected direction by maintaining the azimuthal position of the detector substantially constant during the measurement, and the different measurements being made in different directions. - Claims allowed, 7.

7141. Condenser Gravity Meter; Hughes M. Zenor, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent, 2,322,681, issued June 22, 1943.

A gravity meter comprising, in combination, a condenser, one plate of which is movable in response to changes in gravity in a manner to change the value of the capacity of said condenser, a fixed condenser equal in capacity to the aforesaid condenser at a base station, an oscillator comprising an oscillating circuit, means for selectively connecting one or the other of said condensers in said circuit, a second oscillator, means for beating the frequency of said oscillators one against the other, said second



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oscillator including means for adjusting the frequency thereof when either of said condensers is in the circuit of said first oscillator, whereby any change in the frequency of said first oscillator occasioned by alternately connecting said condensers in said first oscillating circuit at a field station constitutes a measure of the difference in gravity between said field station and the base station. - Claims allowed, 5.

7242. Well-Logging Method and Apparatus; Jacob Neufeld, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,323,484, issued July 6, 1943.

Method of geophysical exploration that comprises moving within a well bore a mass of metallic sodium rendered artificially radioactive by bombardment with a stream of fast deuterons; measuring the radiation emanating from the mass reflected by subterranean strata; and correlatin the measurements so derived with measurements of depth. - Claims allowed, 6.

7243. Method and Apparatus for Determining Effective Porosity; Elmer O. Mattocks, Bartlesville, Okla., assignor to Phillips Petroleum Co a corporation of Delaware. U. S. Patent 2,323,556, issued July 6, 1943.

In apparatus for determining the volume of connected pore spaces in a porous body, the combination comprising a receptacle for containing the body at a predetermined pressure, pressure indicating means connected to the receptacle, means for transmitting gas into the receptacle at a known pressure above said predetermined pressure, gas receiving means of variable volumetric capacity connected to the receptacle, and means associated with the gas receiving means and controlling the pressu within the gas receiving means without loss of gas transmitted thereinto. Claims allowed, 7.

7244. Geochemical Well Logging; Leo Horvitz and Esme E. Rosaire, Houston, Tex., said Horvitz assignor to said Rosaire. U. S. Patent 2,324,085, issued July 13, 1943.

A method for logging during the drilling of a borehole drilled for th purpose of producing hydrocarbons comprising the steps of determining for a considerable portion of the length of the borehole, including a substantial portion traversing nonproductive formations, the relative hydrocarbon content at different depths of the earth traversed by the borehole, and correlating said relative values with depths. - Claims allowed, 16.



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7245. Well Survey Apparatus; L. C. Miller, Dallas, Tex., assignor of one-half to Eastman Oil Well Survey Co., Dallas, Tex., a corporation of Delaware, and one-half to Eastman Oil Well Survey Corporation, Long Beach, Calif., a corporation of California. U.S. Patent 2,324,103, issued July 13, 1943.

A protective housing for well-survey instruments including, an outer casing, an inner coaxial casing, a coupling element having the upper ends of said casings secured thereto, whereby said element closes said upper ends and also whereby the casings are suspended therefrom, heat-insulating material between the casings, a cooling container insertable within the inner casing which casing is also adapted to receive the well survey instrument, a closure for closing the lower end of the inner casing, and a packing and closure element removably secured in the lower end of the outer casing for closing and sealing the same. - Claims allowed, 7.

7246. Process for Locating Valuable Subterranean Deposits; L. W. Blau, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Reissue Patent 22,345, issued July 13, 1943; original No. 2,269,889; issued January 13, 1942.

A method of prospecting for petroleum deposits which comprises collecting samples of soil at spaced points along the surface over an area under investigation, and examining said samples for the determination of the presence therein of a product of the action of hydrocarbon-consuming bacteria on hydrocarbons. - Claims allowed, 11.

7247. Projectile for Perforating Bore Hole Casings; Marcel Schlumberger, Paris, France. Vested in the Alien Property Custodian. U. S. Application A.P.C. 276,093, published May 4, 1943.

The present invention relates to shooting devices, and more particularly to apparatus for perforating the metallic casings usually inserted within boreholes after drilling. These objectives are attained by providing a composite perforating projectile which comprises essentially an inner core of hard and relatively heavy metal such as, for example, hardened steel, and an outer sheath preferably formed of a light and somewhat fusible material such as, for example, an aluminum alloy. The projectile is so constructed that the soft outer sheath is torn away from the core as soon as it is discharged from the gun, and only the hard steel core pierces the metallic borehole casing. It is also proposed to design the outer sheath so as to facilitate its removal from the hard core when discharged from the gun. - V. S.

7247



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7248. Method and Means for Determining and Tracing Insulating, in Particular Oil-Carrying Strata; Oscar Martienssen, Kiel, Germany Vested in the Alien Property Custodian. U. S. Application A.P.C. 333,469, published May 18, 1943.

This invention relates to methods and means for determining and tracing geophysical strata of insulating character, in particular oil-carrying beds, by measurements taken at the earth surface. Nonoscillatory surges of an electric charge are applied to the ground in a shock-like or explosive manner and in such a way that they decay aperiodically. These aperiodic surges spread in the ground, and when meeting an insulating, in particular oil-carrying, bed are impeded and reflected to the surface. The reflected charge arriving at the surface is received by means of electric receiving devices as used for radio and telegraphic purposes, and is made visible by means of an oscillograph or the like, in particular with the aid of a cathode-ray oscillograph. This oscillograph is caused to indicate the decaying curve of the original aperiodic charge so that the reflected charge is manifested by its modifying effect on the decaying curve. The measurement of the time elapsed between the emission of the original surge and the receipt of its reflection, in consideration of the previously determined speed of propagation of the charge in ground, is used as a measure for determining the depth of the reflecting stratum in a way similar to that used in the seismographic reflection method. A further improvement is obtained if the just-described reflect method is used in combination with a seismographic method. - V. S.

7249. Electromagnetic Device for Searching Sunken Ships, Iron-Containi Sands and Other Metal-Containing Bodies on the Sea Ground; Arna Zabelli, Rome, Italy. Vested in the Alien Property Custodian. U. Application A.P.C. 410,612 published May 18, 1943.

This invention relates to an electromagnetic device for searching sunken ships, iron containing sands or other metal containing bodies on sea bottom. The device consists essentially of a heavy waterproof case containing an electromagnet and an oscillatory circuit exciting the said electromagnet. By means of this device, the research is effected by measuring the impedance variations of the oscillatory circuit produced by the variations in the magnetic field of the electromagnet, due to the presence of metal-containing, especially of iron-containing, bodies. To compensate disturbing influences during the measuring, a Wheatstone bridge with additional variable resistance is inserted in the exciting circuit of the electromagnet. Provisions are made to allow before each measurement such a displacement of the galvanometer contacts on the



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resistances that the galvanometer is in the zero position. This regulation is effected with the device drawn up over the point of measurement, for the purpose of eliminating the reactance variations due to magnetic disturbances which are frequent on the bottom of the sea. - V. S.

7250- Oil Well Logging Method; C. R. Hocott, Houston, Tex., assignor to Standard Oil Development Co., Linden, N. J. Canadian Patent 413,399, issued June 22, 1943.

A method for logging wells drilled for oil which comprises collecting samples of the formations traversed at successive depths during the drilling operation, measuring the oxidation reduction potential of each of said samples and correlating the values measured with sample depths. - Claims allowed, 4.

7251. Geophysical Exploration Apparatus; H. M. Evjen, Houston Tex., assignor to Nordel Corporation, Houston, Tex. Canadian Patent 415,209, issued September 14, 1943.

A system for electrical prospecting, comprising an earth-current circuit including a source of direct current, a pair of spaced earth electrodes, and reversing means connected between said source and said electrodes for reversing the direct current at a predetermined controlled frequency whereby an earth current having a predetermined frequency is passed through the earth between said electrodes, a potential circuit including potential pick-up electrodes located at spaced points adjacent the earth's surface lying within the field of influence of said earth current, a direct-current indicating device connected to indicate the potential of said potential circuit, and reversing means synchronized with said first reversing means and connected between said potential pick-up electrodes and said indicating device to convert the picked-up potential difference into a unidirectional potential suited to actuate said indicating device, and coupling means connected between said earth-current circuit and said potential which is directly proportional to the current flowing in said earth-current circuit at the instant of measurement, said coupling means comprising a resistance connected in series with said earth-current circuit to develop a potential drop thereacross proportional to the current flowing in said earth-current circuit, a potentiometer connected in said potential circuit to apply thereto a potential drop opposing the potential picked up from said potential pick-up electrodes, a condenser connected across said potentiometer, a second condenser, and synchronized switch means connected to alternately connect said second condenser across said resistance and across said first condenser, whereby said second condenser periodically



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receives a charge from the potential drop across said resistance and applies the same to said first condenser for thereby building up a charge in said first condenser which is proportional to the potential drop across said resistance. - Claims allowed, 7.

7252. Seismic Exploration Apparatus; J. P. Woods, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif. Canadian Patent 415,223, issued September 14, 1943.

For use in seismic exploration, a closed-path magnet structure comprising two members, one of said members being a magnet and the other an armature therefor, resilient means for supporting one of said members with regard to the other, one of said members being adapted to be laid loosely in contact with the ground to be subject to the vibrations thereof, and the other member being resiliently supported by said means to operate as an inertia element with respect to the vibratory member, one of said members having two legs and the other member being positioned by said resilient means to bridge said legs to form a variable nonmagnetic gap in the closed magnetic circuit comprising said members, whereby said magnetic structure is subjected to variation of magnetic flux upon vibration of the vibratory member. - Claims allowed, 10.



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